



[4910-13-P]

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 39**

**[Docket No. FAA-2016-6744; Directorate Identifier 2016-NE-12-AD; Amendment 39-18736; AD 2016-25-10]**

**RIN 2120-AA64**

**Airworthiness Directives; Rolls-Royce plc Turbofan Engines**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final rule.

**SUMMARY:** We are adopting a new airworthiness directive (AD) for certain Rolls-Royce plc (RR) RB211-Trent 875-17, RB211-Trent 877-17, RB211-Trent 884-17, RB211-Trent 884B-17, RB211-Trent 892-17, RB211-Trent 892B-17, and RB211-Trent 895-17 turbofan engines. This AD requires machining and inspecting parts related to the high-pressure compressor (HPC) and replacing HPC parts found defective. This AD was prompted by inspection of RR Trent 800 engines returned from service that revealed flame erosion and axial cracking on the stage 3 disk rim of the HPC stage 1-4 rotor disks shaft. We are issuing this AD to correct the unsafe condition on these products.

**DATES:** This AD becomes effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

The Director of the Federal Register approved the incorporation by reference of a certain publication listed in this AD as of [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** For service information identified in this final rule, contact Rolls-Royce plc, Corporate Communications, P.O. Box 31, Derby, England, DE24 8BJ; phone: 011-44-1332-242424; fax: 011-44-1332-249936; email: [http://www.rolls-royce.com/contact/civil\\_team.jsp](http://www.rolls-royce.com/contact/civil_team.jsp); Internet: <https://customers.rolls-royce.com/public/rollsroycecare>. You may view this service information at the FAA, Engine & Propeller Directorate, 1200 District Avenue, Burlington, MA. For information on the availability of this material at the FAA, call 781-238-7125. It is also available on the Internet at <http://www.regulations.gov> by searching for and locating Docket No. FAA-2016-6744.

#### **Examining the AD Docket**

You may examine the AD docket on the Internet at <http://www.regulations.gov> by searching for and locating Docket No. FAA-2016-6744; or in person at the Docket Management Facility between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this AD, the mandatory continuing airworthiness information (MCAI), the regulatory evaluation, any comments received, and other information. The address for the Docket Office (phone: 800-647-5527) is Document Management Facility, U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE., Washington, DC 20590.

**FOR FURTHER INFORMATION CONTACT:** Robert Green, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 1200 District Avenue, Burlington, MA 01803; phone: 781-238-7754; fax: 781-238-7199; email: [robert.green@faa.gov](mailto:robert.green@faa.gov).

## **SUPPLEMENTARY INFORMATION:**

### **Discussion**

We issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 by adding an AD that would apply to the specified products. The NPRM was published in the *Federal Register* on July 26, 2016 (81 FR 48724). The NPRM proposed to correct an unsafe condition for the specified products. The MCAI states:

Inspection of Trent 800 engines returned from service revealed flame eroded areas and axial cracking on the rear Stage 3 disc of the High Pressure Compressor (HPC) Stage 1-4 drum. This is considered to be the result of a localised fire originating from an excessive rub at the stage 3-4 forward seal fin.

This condition, if not detected and corrected, could lead to an uncontained engine failure and release of high energy debris, possibly resulting in damage to the aeroplane and injury to occupants.

You may obtain further information by examining the MCAI in the AD docket on the Internet at <http://www.regulations.gov> by searching for and locating Docket No. FAA-2016-6744.

### **Comments**

We gave the public the opportunity to participate in developing this AD. We considered the comments received.

### **Request to Revise Inspection for Wear and Cracks**

American Airlines, Inc., (AAL) requested that the requirement in paragraph (e)(1)(i) of this AD be revised to allow the standards in the RR Trent 800 Engine Manual (EM) to be used in the assessment for wear and cracks. AAL indicated that RR Trent 800 EM task 72-41-31-200-801 addresses the conditions of wear and cracking and provides limits and rejection criteria. AAL commented that RR has noted that the types of damage

described in RR Standard Practices Manual 70-01-02-200-000 including the terms "burned/charred" and "eroded" provide an adequate description of flame erosion.

AAL further indicated that if, based on the proposed requirement in paragraph (e)(1)(ii) of this AD, any wear is found on the forward stage 3-4 seal fin, then the HPC 1-4 rotor would have to be replaced. AAL noted, however, that EM task 72-41-31-200-801 allows the seal fin to exhibit wear within the diametral limits of 23.665 to 23.722 inches.

RR indicated that the requirement in this AD to reject the part for evidence of wear should be eliminated. RR noted that the EM for the affected engines already includes inspections for wear and other damage.

We partially agree. We agree with AAL's assessment that the EM task would allow wear as defined above while paragraph (e)(1)(i) in this AD, as proposed, would not have allowed any wear. We also agree with RR that it is not necessary to specify an inspection for wear.

We disagree that it is necessary to refer to the EM task in the requirements of this AD. We have revised the requirements of this AD to remove the requirement to inspect for "wear." We are removing this requirement because seal tooth wear serviceability limits are already defined in the RR Trent 800 EM.

### **Request to Revise Requirement to Machine HPC Stage 3 Inner Shroud**

RR and AAL requested that the requirement in paragraph (e)(1)(ii) of this AD to machine the HPC stage 3 inner shroud be revised. AAL noted that the HPC 1-4 disks shaft is a life-limited part; therefore, AAL tracks its cycle use, both total part cycles and cycles since last piece-part inspection. There is, however, no mandatory tracking requirement for the HPC stage 3 inner shroud. AAL, therefore, cannot ensure that it can

comply with RR Service Bulletin (SB) RB211.72-J195, dated February 26, 2016, before exceeding 5,000 duty cycles since new or since last piece-part inspection of the HPC stage 1-4 rotor disks shaft, as proposed in this AD. AAL and RR suggested that the requirement in paragraph (e)(1)(ii) of this AD become an optional terminating action.

We partially agree. We disagree with revising the requirement in paragraph (e)(1)(ii) in this AD to machine the HPC stage 1-3 shroud because that addresses the unsafe seal clearance condition. We agree, however, that the proposed language in paragraph (e)(1) may be misinterpreted to refer to tracking the cycles on the HPC stage 3 inner shroud. Therefore, we clarified paragraph (e)(1) of this AD to read: "(1) Before the HPC stage 1-4 rotor disks shaft cyclic life exceeds 5,000 duty cycles since new, or 5,000 duty cycles since last HPC stage 1-4 rotor disks shaft piece-part inspection, whichever occurs later, do the following:...." This change clarifies that the 5,000 duty cycles since new criterion in this AD applies only to the HPC stage 1-4 rotor disks and not the HPC stage 3 inner shroud.

### **Support for the NPRM**

The Boeing Company, Inc., commented that it supported the proposed rule as written.

### **Conclusion**

We reviewed the available data, including the comments received, and determined that air safety and the public interest require adopting this AD with the changes described previously. We determined that these changes will not increase the economic burden on any operator or increase the scope of this AD.

## **Related Service Information under 1 CFR Part 51**

RR has issued SB RB.211-72-J195, dated February 26, 2016. The SB describes procedures to machine the HPC stage 3 inner shroud and to inspect the HPC stage 1-4 rotor disks shaft. This service information is reasonably available because the interested parties have access to it through their normal course of business or by the means identified in the ADDRESSES section.

## **Costs of Compliance**

We estimate that this AD affects 125 engines installed on airplanes of U.S. registry. We did not estimate any time to machine the HPC stage 3 inner shroud because this is accomplished during routine overhaul. We estimate the following costs to comply with this AD:

### **Estimated Costs**

<b>Action</b>	<b>Labor cost</b>	<b>Parts cost</b>	<b>Cost per product</b>	<b>Cost on U.S. operators</b>
Inspection of the HPC stage 1-4 rotor disks	8 work-hours X \$85 per hour = \$680	\$0	\$680	\$85,000

## **Authority for This Rulemaking**

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator. "Subtitle VII: Aviation Programs," describes in more detail the scope of the Agency's authority.

We are issuing this rulemaking under the authority described in "Subtitle VII, Part A, Subpart III, Section 44701: General requirements." Under that section, Congress

charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

### **Regulatory Findings**

We determined that this AD will not have federalism implications under Executive Order 13132. This AD will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify this AD:

- (1) Is not a “significant regulatory action” under Executive Order 12866,
- (2) Is not a “significant rule” under the DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979),
- (3) Will not affect intrastate aviation in Alaska to the extent that it justifies making a regulatory distinction, and
- (4) Will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

### **List of Subjects in 14 CFR Part 39**

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

### **Adoption of the Amendment**

Accordingly, under the authority delegated to me by the Administrator, the FAA amends 14 CFR part 39 as follows:

## **PART 39 - AIRWORTHINESS DIRECTIVES**

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

### **§ 39.13 [Amended]**

2. The FAA amends § 39.13 by adding the following new airworthiness directive (AD):

2016-25-10 **Rolls-Royce plc:** Amendment 39-18736; Docket No. FAA-2016-6744;  
Directorate Identifier 2016-NE-12-AD.

#### **(a) Effective Date**

This AD becomes effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

#### **(b) Affected ADs**

None.

#### **(c) Applicability**

This AD applies to Rolls-Royce plc (RR) RB211-Trent 875-17, RB211-Trent 877-17, RB211-Trent 884-17, RB211-Trent 884B-17, RB211-Trent 892-17, RB211-Trent 892B-17, and RB211-Trent 895-17 turbofan engines that have not incorporated RR modification 72-J195, in production, or RR Service Bulletin RB.211-72-J195, dated February 26, 2016, in service.

#### **(d) Reason**

This AD was prompted by inspection of RR Trent 800 model engines returned from service that revealed flame erosion and axial cracking on the aft face of the stage 3



disk rim of the high-pressure compressor (HPC) stage 1-4 rotor disks shaft. We are issuing this AD to correct the unsafe condition on these products.

**(e) Actions and Compliance**

Comply with this AD within the compliance times specified, unless already done.

(1) Before the HPC stage 1-4 rotor disks shaft cyclic life exceeds 5,000 duty cycles since new, or 5,000 duty cycles since last HPC stage 1-4 rotor disks shaft piece-part inspection, whichever occurs later, do the following:

(i) Perform fluorescent penetrant and visual inspections of the HPC stage 1-4 rotor disks shaft forward stage 3-4 seal fin and aft face of the stage 3 disk rim for cracks and flame erosion. Any findings of cracks or flame erosion constitute a failure of the HPC stage 1-4 rotor disks shaft.

(ii) Machine the HPC stage 3 inner shroud to the dimensions shown in Figure 1 of RR Service Bulletin (SB) RB.211-72-J195, dated February 26, 2016.

(2) If the HPC stage 1-4 rotor disks shaft fails the inspections required by paragraph (e)(1)(i) of this AD, replace with a part eligible for installation before further flight.

**(f) Alternative Methods of Compliance (AMOCs)**

The Manager, Engine Certification Office, FAA, may approve AMOCs for this AD. Use the procedures found in 14 CFR 39.19 to make your request. You may email your request to: ANE-AD-AMOC@faa.gov.

**(g) Related Information**

(1) For more information about this AD, contact Robert Green, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 1200

District Avenue, Burlington, MA 01803; phone: 781-238-7754; fax: 781-238-7199;  
email: robert.green@faa.gov.

(2) Refer to MCAI European Aviation Safety Agency AD 2016-0078, dated April 20, 2016 (corrected April 27, 2016), for more information. You may examine the MCAI in the AD docket on the Internet at <http://www.regulations.gov> by searching for and locating it in Docket No. FAA-2016-6744.

**(h) Material Incorporated by Reference**

(1) The Director of the Federal Register approved the incorporation by reference (IBR) of the service information listed in this paragraph under 5 U.S.C. 552(a) and 1 CFR part 51.

(2) You must use this service information as applicable to do the actions required by this AD, unless the AD specifies otherwise.

(i) Rolls-Royce plc (RR) SB RB.211-72-J195, dated February 26, 2016.

(ii) Reserved.

(3) For RR service information identified in this AD, contact Rolls-Royce plc, Corporate Communications, P.O. Box 31, Derby, England, DE24 8BJ; phone: 011-44-1332-242424; fax: 011-44-1332-249936; email: [http://www.rolls-royce.com/contact/civil\\_team.jsp](http://www.rolls-royce.com/contact/civil_team.jsp); Internet: <https://customers.rolls-royce.com/public/rollsroycecare>.

(4) You may view this service information at FAA, Engine & Propeller Directorate, 1200 District Avenue, Burlington, MA. For information on the availability of this material at the FAA, call 781-238-7125.

(5) You may view this service information at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: <http://www.archives.gov/federal-register/cfr/ibr-locations.html>.

Issued in Burlington, Massachusetts, on November 23, 2016.

Colleen M. D'Alessandro,  
Manager, Engine & Propeller Directorate,  
Aircraft Certification Service.  
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